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SUCCESSFUL WATER SOFTENING AND WHAT IT COSTS THE VILLAGE OF HINSDALE[1]

By C. B. Williams

Certain cities of the country have solicited and obtained aid from engineers and managers in correcting their water troubles, often called the red water plague; but many towns and cities are afflicted with what might be called the hard red water plague. This is especially true in parts of Illinois, and these cities, except for a more or less internal grumbling, remain inactive.

Why any prosperous community will for years put up with a water supply which is universally condemned is a psychological question that has never been satisfactorily answered. The same poor service from some other public utility would bring such a storm of disapproval that it would shortly be corrected.

Hinsdale, Illinois, was in this rut. It is a rapidly growing suburb of Chicago of about three thousand inhabitants. The village owns and operates a water and light plant and garbage incinerator.

The water supplied to the village is from a 12 inch well about 210 feet deep, the supply coming from the limerock known as the Niagara limestone. This water, while entirely unaffected by any surface contamination, is very disagreeable on account of its extreme hardness, its strong taste and its excessive iron contents. The latter forms a deposit in the pipes, which when disturbed by an unusual consumption, as in the case of fire, or the shutting off of a district for repairs, causes the water to run red for a number of hours thereafter.

General dissatisfaction with this supply led the Hinsdale authorities to investigate the softening process, and to its final adoption. Last August the village put in operation a softening plant of about 1,000,000 gallons daily capacity, using the standard lime and soda ash process.

The old plant consisted of steam pumps, pumping directly from the well to the mains. The addition of a primary pumping unit and a softening plant made necessary the rearrangement of the steam pumps and the piping, but left them available for the final pumping.

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[1] Presented at meeting of Illinois Section, January 25, 1916.

The water is now lifted from the well by an electrically driven centrifugal pump, against a total head of 90 to 95 feet, to the top of a softening and settling tank. On entering the tank the raw water is dosed with the lime and soda ash solution. The treated water is directed downward in this tank by an interior cone to within a few feet of the bottom, thence it rises slowly allowing the precipitate to settle to the bottom. This precipitated sludge is removed daily from the tank by a revolving sludge remover and is discharged directly into the sewer.

The settled water is drawn off at the top of the softening tank either to the storage tank of 250,000 gallons capacity or directly to the filters. The filters are of the rapid gravity type, built over a clear well of 12,000 gallons capacity from which the steam pumps take their suction.

Over the filter and clear well is a two story brick house, the second story of which is used for chemical storage. In the lower room with the filters are the chemical mixing tanks, pumps and proportioning apparatus for feeding the chemicals.

The treated and filtered water is clear, bright and free from iron, and as operated the hardness is kept between four and five grains per gallon of hardening salts.

The following analyses of the raw, settled and filtered water were made by the Illinois State Water Survey on October 7, 1915.

Parts per million

	RAW	SETTLED	FILTERED
Turpidity	15	30	0
Color	5	15	0
Alkalinity	362	98	92
Sodium nitrate	1	1.6	0
Sodium chloride	2	2	2
Sodium sulphate	118	263	257
Sodium carbonate		47	43
Magnesium sulphate	120		
Magnesium hydroxide		8	8
Magnesium carbonate	20	17	13
Calcium carbonate	338	16	16
Iron carbonate	3		
Undetermined	42	62	31

A test of thirty days duration has been run to determine the cost of chemicals and the amount of water used for various purposes, which gave these results.

Total water softened	10,016,130 gallons	
Total water used by consumers	8,785,208 gallons	
Total water used in boilers	759,983 gallons	
Total water used washing filters	156,457 gallons	1.56 per cent
Total water used for sludging	216,895 gallons	2.16 per cent
Lime used per thousand gallons	4.001 pounds	
Soda ash used per thousand gallons	1.368 pounds	
Alum used per thousand gallons	0.28 pounds	

The cost of lime is 0.37 cent, soda ash 0.795 cent and alum 2 cents per pound, at these prices the cost for chemicals is 2.624 cents per thousand gallons. To this chemical cost must be added the cost of power used for the primary pumping, which is 1.35 cent per thousand gallons; the cost for attendance is small, as only part of one man's time can be charged to softening or 0.4 cents; interest, depreciation and repairs bring the total extra cost to 5.917 cents per thousand gallons. This is the extra charge that the village must meet to obtain soft water.

To show concretely the actual saving to the consumers for this extra expense is rather difficult. In Hinsdale the great majority of the 800 consumers have rainwater cisterns, and the houses are double piped and provided with electric or water motors for elevating the soft water. This costs each householder an investment of $300 to $500.

During this year at least thirty houses have been built in which this investment has been saved. The interest, depreciation and repairs on the $300 minimum investment amount to $28 per year, and are entirely saved in the new houses; while on the older houses there is at least a yearly saving of $7.

The use of bottled water by many who disliked the old water has been nearly discontinued; several laundries make large savings of soap, and boiler users save considerable sums formerly spent for boiler compounds and repairs.

It is evident that could all the various economies be as definitely shown as is the cost of softening, there would be an appreciable credit to the softening process. Further there is a certain satisfaction and value to having available any quantity of soft, drinkable and perfectly clear water not measurable in dollars and cents.

The people are the final arbiters of the success or failure of an engineering project, and it is safe to say that the residents of Hinsdale would pay many times the cost of the plant rather than return to the old unsoftened water. To quote one prominent citizen—

> I was very much opposed to the project from its inception and did all in my power to defeat it, but I will say now, that if for any reason the plant should be discontinued, I would leave Hinsdale at once.